



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,117	07/23/2003	Michele J. Berry	884.548US2	9523
21186	7590	06/05/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			THOMAS, TONIAE M	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 06/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/626,117

Applicant(s)

BERRY, MICHELE J.

Examiner

Toniae M. Thomas

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 April 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 14-34 and 37-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14-34 is/are allowed.
- 6) ☒ Claim(s) 37,38 and 41 is/are rejected.
- 7) ☒ Claim(s) 39,40,42 and 43 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 04/19/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 19 April 2006 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 37 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Master (US 6,229,207 B1) in view of Bronson et al. (US 5,288,944).

Master discloses a microelectronic device (fig. 3 and accompanying text). The device comprises the following elements, **as recited in claim 37**: a package substrate 42 having pin contact pads 52 on a first surface 46 thereof (fig. 3 and col. 5, lines 46-63); a plurality of pins 54 soldered to the pin contact

pads on the first surface of the package substrate (*fig. 3 and col. 5, lines 46-63*); and a microelectronic die 40 connected to the package substrate (*fig. 3 and col. 5, lines 46-63*), the microelectronic die having bond pads 48 that are conductively coupled to the pins through the package substrate (*fig. 3 and col. 5, lines 46-63*).

Master lacks anticipation of a cured polymer material about solder joints associated with the pins. Bronson, on the other hand, does disclose a cured polymer material about solder joints associated with a plurality of pins. As discussed above with respect to claim 31, Bronson discloses a substrate for use in a microelectronic circuit package 120. The package substrate comprises: pin contact pads 140 on a first surface 130 of the substrate (*fig. 2 and col. 7, lines 51-53*); a plurality of pins 170 soldered to the pin contact pads on the first surface of the package substrate (*fig. 2 and col. 8, lines 11-14*); and a cured polymer material 200 about solder joints associated with the pins (*fig. 2; col. 8, lines 32-38; col. 8, lines 43-47; col. 9, lines 11-22*). A layer of the cured polymer material 200 enshrouds a plurality of solder joints associated with the pins, **as recited in claim 41** (*fig. 2*). A solder joint is formed by the solder connection 56 between each pad 52 and a corresponding pin 54. The cured polymer material 200 is used to prevent the failure of the solder connections 56 during a standard thermal fatigue test (*Bronson - col. 8, lines 32-38*). This would suggest to the skilled artisan that the cured polymer material is able to prevent the failure of the solder connections during high temperature

processes. The failure of the solder connections would inherently result in movement of the pins.

Thus, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Master by providing a cured polymer material about solder joints associated with the plurality of pins 170, as taught by Bronson, because the cured polymer material is able to prevent the failure of the solder connections 190 during subsequent high temperature processes (e.g. an underfilling process) and, thereby, prevents movement of the pins 170.

3. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Master in view of Bronson as applied to claim 37 above, and further in view of Wang et al. (US 6,610,559 B2).

Master lacks anticipation of an underfill material between the microelectronic die and the package substrate, **as recited in claim 38**. The Wang et al. patent (Wang), on the other hand, discloses an underfill material between a microelectronic die 401 and a substrate 407 (*fig. 4 and accompanying text*). Masters discloses a microelectronic device, wherein the device comprises: a microelectronic die 401 connected to a package substrate 407 (*fig. 4 and col. 8, lines 14-20*); and an underfill material 411 between the die and the substrate (*fig. 4 and col. 8, lines 21-39*).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the combination of Master and Bronson, by providing an underfill material between the die 40 and the package substrate 42 of Master, as taught by Wang, because the underfill is able to provide mechanical, electrical, and environmental protection for the microelectronic device (*Wang* - col. 8, lines 35-38).

Allowable Subject Matter

4. Claims 14-34, 44, and 45 are allowable over the prior art of record. The prior art of record does not anticipate, teach or suggest a substrate for use in a microelectronic circuit package substantially as claimed, wherein the package comprises a separate portion of encapsulation material surrounding a solder joint associated with each of a plurality of individual pins, as recited in independent claims 14 and 18.

5. Claims 39, 40, 42, and 43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

6. Applicant's arguments filed 19 April 2006 have been fully considered but they are not persuasive.

Applicant has argued that the final Office action of 12 January 2006 has not shown a suggestion to combine Master and Bronson and has not shown a reasonable expectation of success. The office action states that an advantage of

combining Master with Bronson is to “prevent the failure of the solder connections during high temperature processes.” Applicant has argued that Master shows substrates that are organic and states that the soldering temperature cannot exceed the decomposition temperature of the substrate. Furthermore, Applicants argue that the office action has not shown that the organic substrates of Master would be subject to the high temperatures of Bronson. As previously explained, to be properly combinable, the substrates of Master need not be subjected to the high temperatures disclosed in Bronson. Bronson discloses an encapsulant for solder connections, which prevents thermal fatigue of the connections and, thus, any significant increase in electrical resistance when the solder connections are subjected to elevated temperatures. The connections of Master are heated at temperatures of about 240 - 275°C. Admittedly, the heating temperatures of Master are not as high as those disclosed by Bronson. However, since the encapsulation technique of Bronson protects the solder connections from thermal fatigue, during processing temperatures at which exceed those disclosed by Master, it would have been obvious to the skilled artisan that this encapsulation technique would ensure that none of the solder connections of Master would fail as a result of thermal fatigue or exhibit any increase in electrical resistance. The fact that the temperatures used to fabricate the product of Master do not exceed those disclosed in Bronson provide a reasonable expectation that the benefits extolled by Bronson would also be exhibited by the product of Master.

In addition, during the standard thermal fatigue test, the encapsulated solder connections are subjected to sinusoidal thermal cycling between 0 and 100 °C. These test temperatures are less than those used to fabricate the product of Master. Hence, if the encapsulated solder connections are capable of passing the thermal fatigue test in which temperatures do not exceed 100°C, encapsulating the solder connections of Master, which are subjected to temperatures as high as 275°C would ensure the thermal stability of the solder connections of Master.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 5:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Toniae M. Thomas
Toniae M. Thomas
Patent Examiner
Technology Center 2800

TMT
30 May 2006